

CLAIMS

What is claimed is:

1. A coaxial engine starter for starting an engine having a ring gear, comprising:

an electric motor including an armature shaft;

an output shaft coaxial with said armature shaft, said output shaft having a clutch end;

an integrated gear support and clutch barrel unit selectively driven by said armature of said electric motor, said unit including a body, said body having a gear support side and a clutch side, said output shaft being operatively connected with said clutch side of said body;

an epicycle gear reduction assembly fitted between and operatively connecting said armature shaft of said electric motor and said gear support side of said body, said reduction assembly being formed to reduce the rotation of said armature shaft; and

a one-way clutch provided on said clutch side of said body to essentially control transmission of rotations between said armature shaft and said output shaft, said clutch end of said output shaft being operatively connected to said one-way clutch.

2. The coaxial engine starter of Claim 1, wherein said armature shaft has a sun gear formed thereon.

3. The coaxial engine starter of Claim 2, wherein said reduction assembly includes a plurality of planetary gears mounted on said gear support side of said body.

4. The coaxial engine starter of Claim 3, wherein said starter includes a motor body and a stationary gear fitted to said motor body, said armature shaft having a sun gear formed thereon, said plurality of planetary gears being operatively disposed between said sun gear and said stationary gear for providing rotational speed reduction therebetween.

5. The coaxial engine starter of Claim 4, further including a plurality of planetary gear shafts extending from said gear support side of said body.

6. The coaxial engine starter of Claim 5, wherein said clutch side of said body is defined by an annular ring extending from said body.

7. The coaxial engine starter of Claim 6, wherein said output shaft includes a clutch end, said clutch end being substantially rotatably positioned within said annular ring of said body.

8. The coaxial engine starter of Claim 7, wherein said one-way clutch includes a plurality of rollers and a like plurality of biasing elements, said rollers and biasing elements being operatively positioned substantially between said annular ring of said body and said clutch end of said output shaft.

9. The coaxial engine starter of Claim 8, wherein said armature shaft has a bearing end and said clutch end of said output shaft includes an armature bearing for rotatably receiving and supporting said bearing end of said armature shaft.

10. The coaxial engine starter of Claim 9, further including a carrier shaft operatively mated to said output shaft and axially movable with respect thereto.

11. The coaxial engine starter of Claim 10, further including a solenoid assembly comprising a solenoid plunger operatively mated with said carrier shaft and a solenoid coil fixed to said motor body.

12. A coaxial engine starter for starting an engine having a ring gear, comprising:

an electric motor including an armature shaft;

an output shaft coaxial with said armature shaft; and

an integrated gear support and clutch barrel unit selectively driven by said armature of said electric motor, said unit including a body, said body having a gear support side and a clutch side, said output shaft being operatively connected with said clutch side of said body.

13. The coaxial engine starter of Claim 12, including an epicycle gear reduction fitted between and operatively connecting said armature shaft of said electric motor and said gear support side of said body, said reduction assembly being formed to reduce the rotation of said armature shaft.

14. The coaxial engine starter of Claim 13, wherein said armature shaft has a sun gear formed thereon and said reduction assembly includes a plurality of planetary gears mounted on said gear support side of said body.

15. The coaxial engine starter of Claim 14, wherein said starter includes a motor body and a stationary gear fitted to said motor body, said armature shaft having a sun gear formed thereon, said plurality of planetary gears being operatively disposed between said sun gear and said stationary gear for providing rotational speed reduction therebetween.

16. The coaxial engine starter of Claim 15, including a one way clutch and a plurality of planetary gear shafts, said one way clutch being provided on said clutch side of said body and said plurality of planetary gear shafts extending from said gear support side of said body.

17. The coaxial engine starter of Claim 16, wherein said clutch side of said body is defined by an annular ring extending from said body and wherein said output shaft includes a clutch end, said clutch end being substantially rotatably positioned within said annular ring of said body.

18. The coaxial engine starter of Claim 17, wherein said one-way clutch includes a plurality of rollers and a like plurality of biasing elements, said rollers and biasing elements being operatively positioned substantially between said annular ring of said body and said clutch end of said output shaft.

19. The coaxial engine starter of Claim 18, wherein said armature shaft has a bearing end and said clutch end of said output shaft includes an armature bearing for rotatably receiving and supporting said bearing end of said armature shaft.

20. The coaxial engine starter of Claim 19, further including a carrier shaft and a solenoid assembly, said carrier shaft being operatively mated to said output shaft and axially movable with respect thereto and said solenoid assembly comprises a solenoid plunger operatively mated with said carrier shaft and a solenoid coil fixed to said motor body.